ASHESI

ENHANCING THE ASHESI EXPERIENCE

A Diagnosis on the maintenance system of academic and hostel facilities in Ashesi University College

April 2013

ASHESI UNIVERSITY COLLEGE

ENHANCING THE ASHESI EXPERIENCE:

A DIAGNOSIS ON THE MAINTENANCE SYSTEM OF ACADEMIC AND HOSTEL FACILITIES IN ASHESI UNIVERSITY COLLEGE

By

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Applied Project Report submitted to the Department of Business Administration, Ashesi University College in partial fulfillment of the requirements for the award of Bachelor of Science degree in Business Administration

APRIL 2013

DECLARATION

I hereby declare that this Applied Project Report is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:…….

Candidate's Name: Sidney Nana Darko Koranteng

Date: 26th April, 2013

I hereby declare that the preparation and presentation of the Applied Project Report were supervised in accordance with the guidelines on supervision of applied projects laid down by Ashesi University College.

Supervisor's Signature:……

Supervisor's Name: Sena Agyepong

Date: 26th April, 2013

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Executive Summary

Ashesi University College (AUC) is a Ghanaian private tertiary institution which began academic operations in 2002. In 2011, AUC moved to its own permanent campus in Berekuso from its rented premises in Accra.

Over the course of AUC's two year stay in its new campus, there have been frequent reports of user dissatisfaction with some facilities located within the academic and hostel (residence hall) settings. Inquiries into the activities of the Operations department revealed inefficient processes involved with the maintenance of academic and hostel facilities.

This project was therefore conducted in response to these challenges. The aim of the project was to identify the challenges and deficiencies in AUC's maintenance system and to develop and recommend solutions to improve upon the system. This goal was attained by conducting interviews on relevant authorities and personnel involved in the maintenance system, and by carrying out an extensive research on the student population to identify their specific concerns and satisfaction levels with AUC facilities.

Consequently, a maintenance plan was developed for use by the maintenance departments and students (primary users). The developed maintenance plan will among other things, address poor response rates of repair personnel and improve users' experience with AUC facilities.

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Chapter One

Introduction to Project

1.1 Chapter Overview

The purpose of this applied project is to identify an operational or managerial concern in an entity, and to apply business administration skills and knowledge to solve the identified issue (Ashesi Catalogue, 2013). This chapter sets the tone for this grand objective. This project is generally geared towards tertiary education in Ghana and the role educational facilities play in enhancing the educational experience. Consequently, the chapter establishes an identified problem within the operations department of an educational outfit: Ashesi University College.

The chapter looks at the broader subject of tertiary education in Ghana, and establishes that a strong investment in educational facilities is crucial to attaining educational excellence. The objective of this project and its significance are disclosed, while a general outline for subsequent chapters is provided to give the reader a good navigation through the document.

1.2 Background to Tertiary Education in Ghana

Education and literacy have become important elements in the global economy (Hunter, 1996). The significance of quality education to productivity and economic development cannot be underestimated. The UN considers literacy as an integral part of life hence its inclusion in the UN Millennium Development Goals for less developed countries, of which Ghana is included (Millennium Development Goals, 2013). In some industries, particularly the service sector, tertiary education

experience has become a vital prerequisite to gaining white-collar jobs (Santiago & Tremblay, 2008). The service sector in Ghana constituted 48.5% of GDP in 2011 (Gross Domestic Product 2012, 2013). Consequently, numerous tertiary institutions, over fifty in number, have sprung up to serve the needs of students who seek to acquire the tertiary education experience (National Accreditation Board, 2012). Estimates of the total number of students in Ghanaian tertiary institutions are about hundred thousand (The Educational System of Ghana, 2013).

The National Accreditation Board identifies thirteen different types of accredited tertiary institutions, including public and private universities, polytechnics and nurses' training colleges. Private university colleges in particular have significantly risen in number. In 1999, there were only 2 operating private universities; however, 21 are currently accredited to award bachelor's degrees (University World News, 2009). One major reason for this rising number is the increased demand for higher education. Enrolments have multiplied more than ten times over the past twenty years (University World News, 2009). Another reason is due to the limited capacity of public tertiary institutions to cater for the growing number of applicants, hence providing an opportunity to exploit. For instance, in 2008, 22,865 qualified students applied for admissions at the public University of Ghana but just over a third were enrolled due to the university's limited capacity (University World News, 2009). Hence, the increase in the number of private tertiary institutions therefore has the potential of significantly addressing the problem of limited capacity in the public institutions.

1.2.1 Educational facilities

While this increment in the number of tertiary institutions is helpful for increasing enrolment, it is equally important for Ghanaian tertiary institutions to have adequate and well-functioning facilities and equipment for conducting academic activities. This is because, facilities are crucial in enhancing and facilitating the educational experience. This is buttressed by a research by KPMG, an authoritative auditing and research institution in Ghana with strong global recognition, which discovered that, investment in school facilities does improve educational attainment (KPMG, 2008).

With this backdrop, this project focuses on one tertiary institution - Ashesi University College (AUC) - in an attempt to ascertain the performance of selected facilities, towards the attainment of an excellent educational experience. The objective is to boost the competitiveness of AUC by diagnosing the system concerned with the management and maintenance of facilities and to develop and recommend solutions that would help improve the reliability of facilities.

1.3 Profile of Ashesi University College (AUC)

AUC, according to its official website, is a private non-profit tertiary institution in Ghana, which has earned credit for its liberal arts program and commitment to educational excellence (Ashesi University College, 2013). Starting in March 2002 in Accra, the College currently operates its own campus on the hills of Berekuso, a village in the Eastern Region of Ghana. Total student enrolment is 565, with about 80 staff and faculty members making the total population (Ashesi University

College, 2013). The university admits foreign nationals, including but not limited to students of Nigerian, Kenyan and Syrian descent. This helps to foster diversity, as well as creating an environment where different ideas and perspectives on issues can be shared. AUC is currently not a full-fledged university, and is affiliated to the University of Cape Coast in Ghana, and Swarthmore College and University of California, Berkeley both in the United States of America. The College runs majors in Business Administration, Computer Science and Management Information Systems (Ashesi University College, 2013).

The AUC culture is built on three main pillars - scholarship, leadership and citizenship - which revolve around the mission to educate a new generation of ethical, entrepreneurial leaders in Africa (Ashesi University College, 2013). The essence of these principles which hinge on excellence and innovation, are incorporated in the teaching methods. The President and brain behind the College is Dr. Patrick Awuah, a former employee of Microsoft Corporation, who resettled in Ghana with the aim of raising the bar of Ghanaian tertiary education through his 'Ashesi' initiative.

This initiative has attracted over USD 7 million in both grants and debt financing, some of which have financed the state-of-the-art Berekuso campus (Ashesi University College, 2013). The first-phase of the campus boasts of an ultra-modern library, two well-stocked computer laboratories, five impressive lecture halls, a 300 student capacity residence hall, and other facilities to enhance the AUC experience. Subsequent phases of the AUC campus will include facilities and developments that would enable AUC compete with top universities in the world.

1.4 Problem Statement

One of AUC's objectives is to provide facilities and equipment that will promote quality education and a vibrant social life (Ashesi University College, 2013). Consequently, the library, computer laboratories, lecture halls and hostels have been stocked with computers, printers, photocopiers, projectors and hostel facilities to help meet this goal. Students have benefitted immensely from these facilities due to their relevance to lecture sessions, course projects and other social and residential activities. Furthermore, much monetary commitment has been made to maintain these academic and residential facilities, so as to ensure their reliability (Annie, 2013).

Over the course of AUC's journey in Berekuso however, legitimate concerns have been raised over the reliability of facilities in both academic and hostel settings. Reports of dissatisfaction from students and lecturers about poor facility performance and the slow response to breakdowns have been recorded through surveys and conversations. The major concern of this project is the absence of an effective maintenance program to check and ensure the reliability of these facilities, hence leading to the disruption of the educational and social objectives AUC stakeholders seek to attain.

1.5 Objective and Significance of Project

The challenges identified in Section 1.4 above led to the need for this project. The project sought to conduct research on AUC's maintenance culture on academic and hostel facilities. The objective of this project, therefore, was to develop an effective

maintenance program that is tailored at ensuring the reliability of facilities, in order to significantly reduce the unpleasant incidents of facility-breakdowns.

It is important to meet these objectives due to the crucial role facilities play in enhancing the AUC experience and contributing to the attainment of AUC's mission and vision. Primarily, the objective was met by conducting a needs assessment on AUC's maintenance department and assessing students' experiences with the use of selected facilities. Solutions tailored for the findings were then proposed for consideration. These proposed solutions were adapted from existing maintenance related concepts and models.

1.6 Outline of Project

1st Chapter: This chapter discussed the objective of the project as well as providing an overview of AUC

2nd Chapter: The second chapter reported on a Needs Assessment, touching on the method, processes, findings and interpretation of the assessment.

3rd Chapter: A literature review on resources related to maintenance and reliability was done in this chapter. This was to help grasp relevant facilities maintenance theories and concepts to aid develop a solution that will be applicable to the AUC context

4th Chapter: The 4th Chapter discussed a set of solutions or deliverables and made useful recommendations that serve as remedies to the identified challenges. The project was also concluded in this section

Chapter Two

Methodology and Needs Assessment

2.1 Chapter Overview

The objective of this chapter is to show how a needs assessment was performed on AUC's operations department to ascertain AUC's maintenance culture on some selected facilities. The chapter revealed how a survey, interviews and observations were used to identify the maintenance issues being faced by the end users of the selected facilities. It was established that, the management of the facilities is below the expectations of students. The results produced by the methodology are instrumental in prescribing solutions to address the maintenance challenges.

2.2 Operational Definitions and Scope

2.2.1 Operational Definitions

For the purpose of this project, facilities and equipment were categorized as *academic facilities* and *hostel facilities*.

Academic facilities specifically refer to AUC's computers, photocopiers, printers and projectors. The hostel facilities within the scope of this project are bedroom doors and furniture (beds, tables, chairs, and lockers), bathroom facilities (shower tub, sink and toilet facilities) and kitchenette facilities (fridges, microwave ovens, kettles).

2.2.2 Operational Scope

The reason for restricting the project to these facilities is because they represent the core of the academic and residence hall experience. They were also selected based on the frequency of reports made about them in general. This was determined by studying the report book for hostel complaints, as well as by getting first-hand information from AUC's head of operations. The mentioned academic facilities also represent the core items students and lecturers use to aid and facilitate the educational experience. It was therefore established that, it was important to study these particular facilities and ascertain the reasons for their complaints.

Also, the facilities were grouped under hostel and academic in line with the segmentation done by AUC's Operations Department. AUC primarily exists for the academic goal, while the residence hall section exists for recreation, shelter and social activities. Grouping facilities under these categories helps to gauge how well the authorities are performing on both fronts, and which areas need improvement.

The primary focus of this project was students as the end users of facilities. The reason is that, students are AUC's target market and the emphasis of the AUC brand and vision. AUC students are the principal users of the college's facilities and form bulk of the AUC population (87%), hence getting a perspective from them gives a true picture of the performance of AUC's maintenance system. While some staff and faculty opinions and sentiments on the subject were considered, they were not recorded for two main reasons. First, lecturers are given a different set of academic facilities (with the exception of projectors) to use in their offices. As a

result, they are not frequent users of students' facilities and may not identify with challenges faced by the students. Secondly, this project is interested in looking at the maintenance system's performance from the students' perspective. Adding staff and faculty to the scope of study would be deviating from this objective.The idea, however, is that, with time, recommendations from the student perspective, can be applied to all facilities in the university as a whole.

2.3 Needs Assessment

A needs assessment is the process of collecting information about an expressed or implied organizational need to either improve organizational performance or correct a deficiency (Barbazette, 2006). This systemic process requires that, the researcher identifies the study population and designs a survey instrument that will be used to collect data. The data concerning the strengths and weaknesses of the organization is then analyzed in order to develop a plan for improving performance (North Dakota Department of Public Instruction, 2012). The focus of this project's needs assessment was two main stakeholders: the operations department of AUC and students (as the end user). The operations department supervises and operates AUC's maintenance system. Conducting the needs assessment aided in identifying lapses in the operations processes.

The goals of the needs assessment were to:

a) Determine the objectives, strengths and weaknesses of the operations department with regards to how facilities are managed;

b) Determine students' opinions of how well the selected hostel and academic facilities function; and
c) Identify gaps or loopholes in the way the facilities are managed so that solutions can be prescribed to improve their reliability and usefulness.

2.4 Research Design and Methodology

In this project, both qualitative and quantitative research techniques were used to gather data on AUC's maintenance culture and the performance of the selected facilities. Qualitative research was used because, the nature of the problem required an exploration and understanding of AUC's maintenance culture from the students' and operation department's perspectives. This is buttressed by this definition: "Qualitative research is the method of choice when the research question requires an understanding of processes, events and relationships in the context of the social and cultural situation. It is useful for obtaining insight into situations and problems concerning which one may have little knowledge" (Oxford Journals, 2013). It is the type of research where the researcher is the primary instrument for data collection and analysis (Merriam, 2009).

Quantitative research was used because it helps to measure social reality and to establish research numerically for further analysis (Sukamolson, 2009). Some of the data obtained from the qualitative research was converted into numerical data in order to give the data some numerical measure for a more analysis. Essentially, the research method involved three main techniques- interview, questionnaires, and observation.

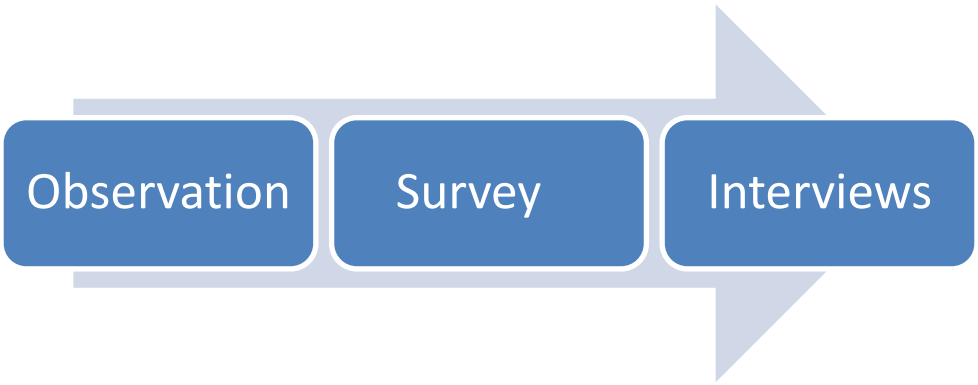


Figure 2.1: Research Methods Used in Study

In-depth semi-structured interviews were conducted with authorities of AUC's operations department, Information Technology (IT) and library departments and hostel coordination team; while questionnaires were directed at the student population. The selected departments were chosen because they either oversee some of AUC's academic facilities or the hostel facilities.

The main research question around which the research methods bordered was:

What peculiar issues do students have with the system concerned with the management of facilities?

Related questions that were formulated were:

- What are Ashesi students' levels of satisfaction on the use of facilities?
- What are the strengths and weaknesses of the Operations team with regards to maintaining facilities?

- What are the gaps/loopholes in the system? and
- How can the current system be improved to meet students' expectations?

2.4.1 Observational Studies

Observational research is a type of research in which a researcher observes ongoing behavior (California State University, 2006). The naturalistic or nonparticipant observation was used in this context. This type of observation involves no intervention by the researcher or any attempt to manipulate variables. It is simply about studying behaviors that occur naturally in natural contexts. (California State University, 2006). The journey to the execution of this project began from personal observations of how some equipment had disrupted academic activities since AUC's move to its permanent campus at Berekuso.

The observations for this project were made over a two semester period between January 2012 and April 2013. During this period, efforts were made to observe the performance of the selected facilities and to study students' reactions towards their use. This type of observation involved the naturalistic type of observation.

The objectives for the observation included estimating the number of breakdowns of facilities per semester and assessing how quickly they were responded to and repaired. However, since information about breakdowns are not always recorded, and in many cases, not recorded, projections (detailed in Table 2.1) based on what data existed had to be made.

Table 2.1: Facilities information

Facility	Number of Facility available	Managing Department	Probability of Estimated Breakdowns per Semester
Photocopiers	2	Library	1
Computers	58	IT	1
Projectors	9	IT	1
Printers	3	Library and IT	1
Bedroom doors	60	*HO Team	0.5
Bedroom furniture	300 beds; 60 tables; 60 chairs; 240 lockers	*HO Team	0.5
Hostel Bathrooms	38	*HO Team	1
Kitchenette kettles	15	*HO Team	0.25
Micro ovens in Kitchenette	15	*HO Team	0.2
Kitchenette fridges	30	*HO Team	0.25

* HO team refers to Hostel Operation team

Source: Data collected from hostel report book

During the last one and a half years of AUC's move to Berekuso, there have been numerous instances where lecture hall projectors failed to work, hence disrupting the flow of teaching. There have also been many observed occasions where printers failed to print students' work. This has usually proven costly since victims suffer the consequences of late submission of work. Again, computer breakdowns have often meant that students have to 'scramble' for the few available working computers in the labs or library. Meanwhile, in the residence halls (hostels), there have been incidents where door knobs became faulty and took long to repair; where micro-ovens failed to heat food; and where cases on faulty refrigerators were left unattended to for long periods. Figure 2.2 below shows the current procedure for reporting a fault in the hostel

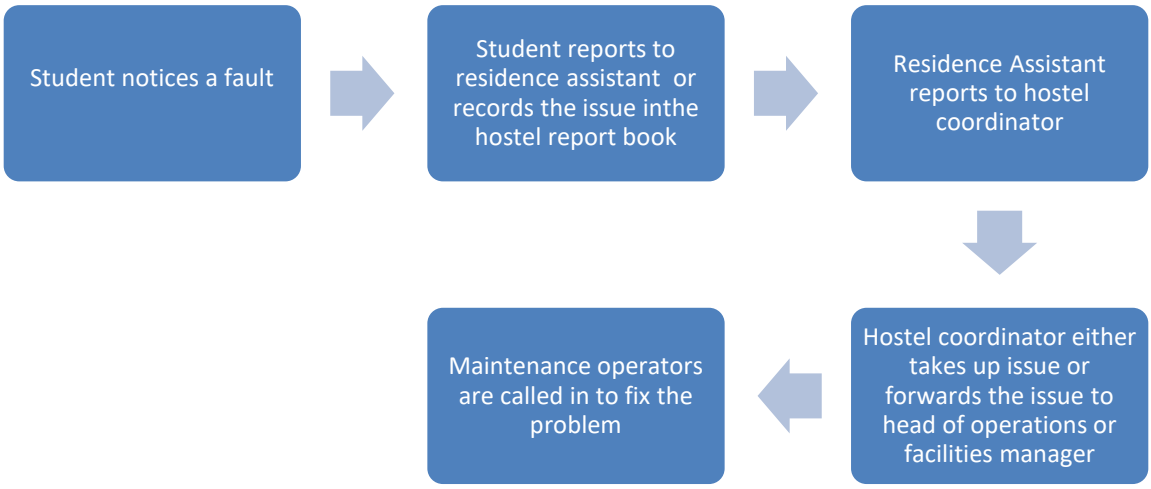


Figure 2.2: Procedure for getting a problem fixed (from the student's perspective)

All these have resulted in some extreme levels of inconvenience, discomfort and frustrations on students and lecturers. For instance, there was an instance when a Business Law class was disrupted for 40 minutes and 25 minutes on two different occasions due to a projector problem. That particular class virtually depends on a projector to aid lectures. As a result of the disruption, the lecturer rushed through topics towards the end of the semester to make up for the huge time loss. For the average AUC student who pays over $2,000 for tuition and about $720 for accommodation, it is imperative that the operations department work to ensure the reliability of such facilities.

In summary, the researcher observed that

- Since there is no business center within close proximity to AUC's campus, students are left with no option than to be overly dependent on the college's academic facilities. For those who desperately need to find an alternative to AUC's academic facilities, the consequence proves costly in the form of lost time and money;
- The unreliability of the facilities may result in the late submission of work by students which could prove unfavorable to their grades in the long run;
- The poor performance of the facilities results in the disruption of classroom activities especially when students and lecturers are dependent on projectors to support classroom activities; and
- AUC suffers a dent on its image when its claims to have world-class equipment are not consistent with what students experience in reality.

2.4.2 User Survey

A survey was conducted with students as respondents, over a 3-week period, to understand their perspective on the performance of the selected equipment. It was also meant to assess their expectations of how reliable they want the facilities to be. The survey was in the form of an online questionnaire administration.

2.4.2.1 Survey Methodology

The sample size of the survey was 72, cutting across students in all four year groups. Questionnaires were filled both electronically and manually. A combination of both random sampling and purposive sampling methods was used. The random sampling method was used to randomly select respondents. This was to remove the likelihood of the researcher being biased in his selection. The purposive sampling method was, however, used to get a minimum of 15 students from each year group in order to get a representative opinion-set from each year group. This is because the entire student population is segregated into four year groups. The purposive 60 (15 students from each year group) were purposefully selected only on year group basis. The remaining 12 respondents also randomly volunteered to take part in the survey. 29.85% of respondents were final year students; 23.18% were juniors; 21.67% were sophomores; while 25.30% were freshmen. Each questionnaire consisted of 6 questions, a sample of which can be found in Appendix 1. The questions attempted to assess respondents' level of satisfaction of the selected facilities, how they dealt with observed faults and breakdowns, and their expectations of how facilities should perform.

The collated results were then analyzed to clearly define the challenges from the student's perspective. The analysis was done by looking at the percentage of students who expressed high satisfaction with the performance of facilities, to those who expressed very little satisfaction. The elements of the scale were: "Very satisfied", "satisfied", "averagely satisfied", "barely satisfied", and "not at all satisfied". Each of the facilities was measured against this scale. If at least 50% of respondents fell below the "satisfied" level, it meant that students were genuinely dissatisfied with the performance of the facility. The facility would then be scrutinized by the operations department to ascertain the causes of dissatisfaction. 50% was chosen as the minimum percentage in consultation with the head of operations. He disclosed that if over half of the respondents expressed displeasure at the performance of facilities, it should be an important matter of concern.

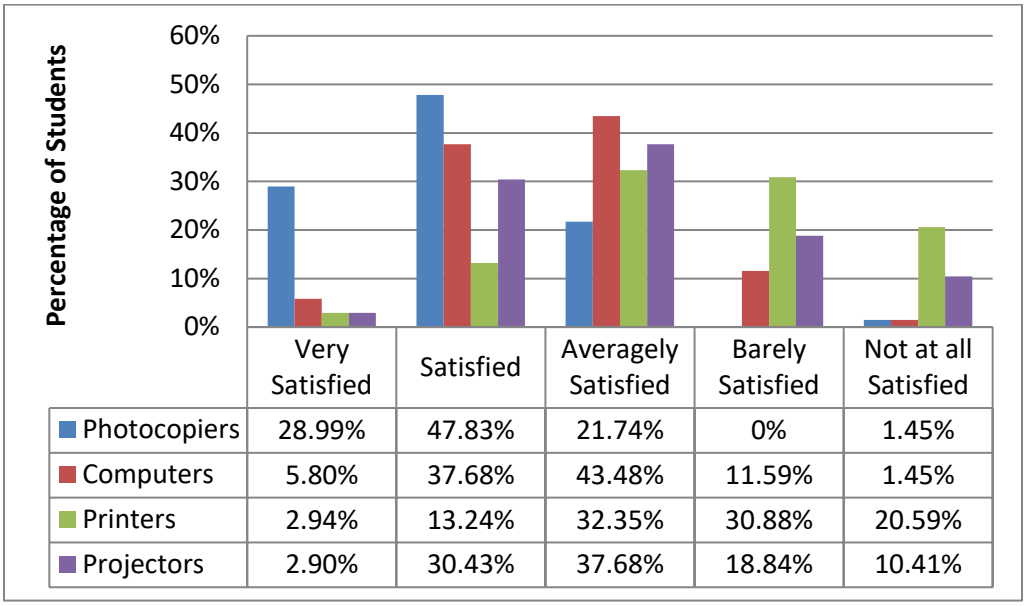
While the sample size may not be representative of the 565 student population, it is worth noting that responses from the respondents showed similar trends and patterns – indicating a data saturation point, hence there was no need to add on to the numbers as the data obtained was representative.

2.4.2.2 Findings and Analysis of User Survey

Satisfactory with performance of facilities

To start with, 81% of the respondents stated that they expect the facilities to function reliably at least, 70% of the times they use them. 32% of respondents expected the facilities to be excellently reliable every single time they attempted to

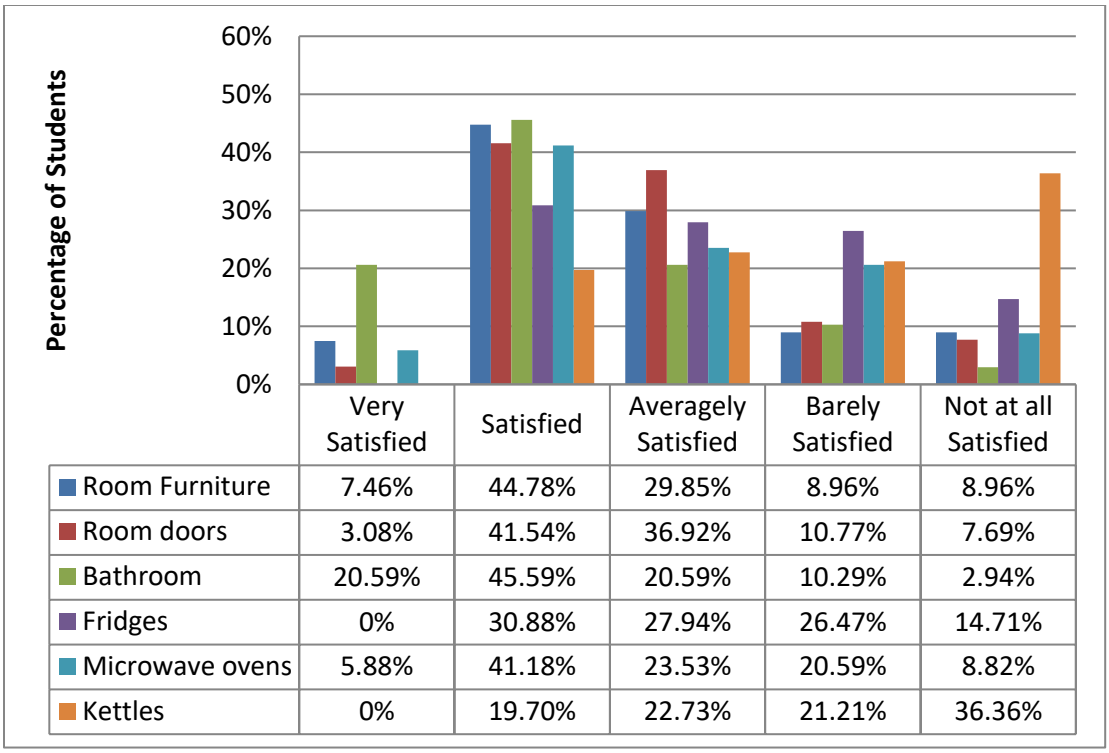
use them. The respondents gave their opinions on the level of satisfaction they received from the performance of the facilities as described in the figures below:



	Very Satisfied	Satisfied	Averagely Satisfied	Barely Satisfied	Not at all Satisfied
Photocopiers	28.99%	47.83%	21.74%	0%	1.45%
Computers	5.80%	37.68%	43.48%	11.59%	1.45%
Printers	2.94%	13.24%	32.35%	30.88%	20.59%
Projectors	2.90%	30.43%	37.68%	18.84%	10.41%

Figure 2.3: Satisfactory levels for performance of academic facilities

Source: Student survey



	Very Satisfied	Satisfied	Averagely Satisfied	Barely Satisfied	Not at all Satisfied
Room Furniture	7.46%	44.78%	29.85%	8.96%	8.96%
Room doors	3.08%	41.54%	36.92%	10.77%	7.69%
Bathroom	20.59%	45.59%	20.59%	10.29%	2.94%
Fridges	0%	30.88%	27.94%	26.47%	14.71%
Microwave ovens	5.88%	41.18%	23.53%	20.59%	8.82%
Kettles	0%	19.70%	22.73%	21.21%	36.36%

Figure 2.4: Satisfactory levels for performance of hostel facilities

Source: Student survey

It can be deduced from Figure 2.3 that the photocopiers received high ratings for level of satisfaction. Approximately 75% of the respondents were highly satisfied with the photocopiers. The computers, printers and projectors however received low ratings. 56% of respondents expressed displeasure with computer performance; 83% expressed displeasure with the printers; and 65% of respondents expressed displeasure with the projectors.

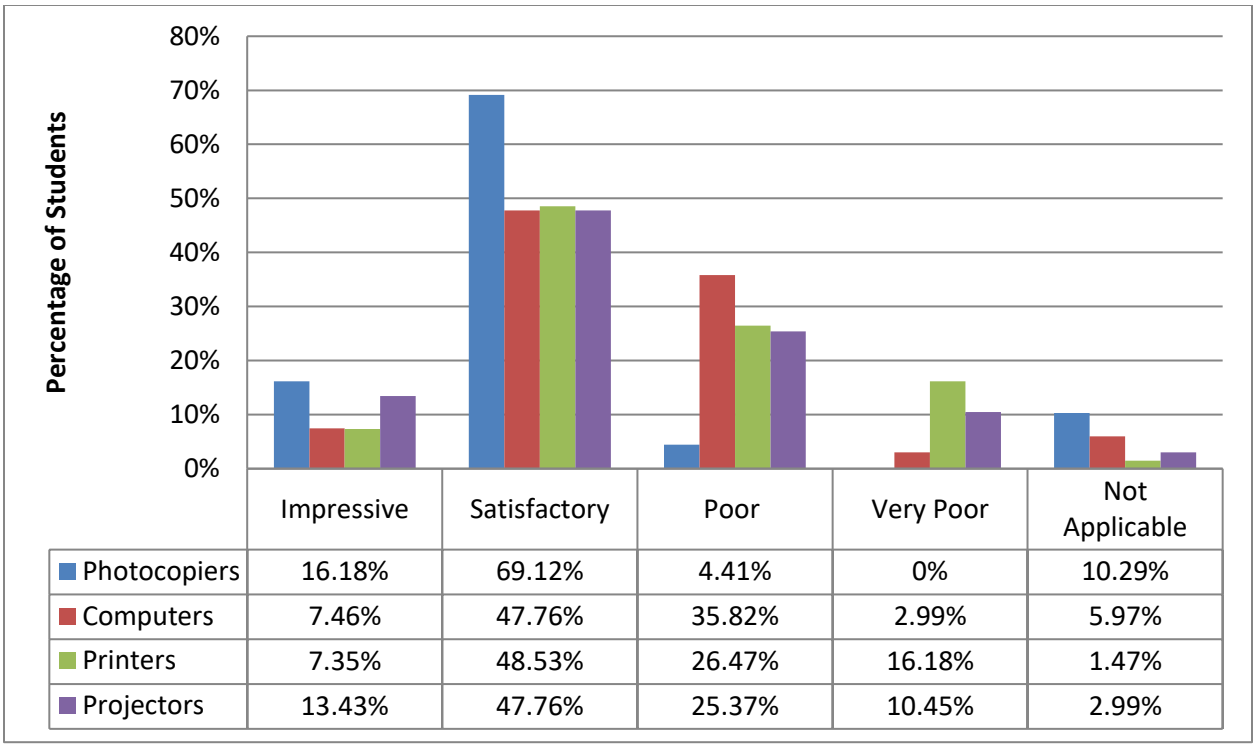
Figure 2.4 matches the satisfactory levels of hostel facility performance to the percentage of respondents. Room furniture and bathroom facilities received the highest ratings of satisfaction, recording an average of 61%. Kettles received the lowest ratings, with 80% of respondents expressing dissatisfaction with kettle

performance. Meanwhile, the room doors, fridges and microwave ovens where each facility had over 50% of respondents expressing dissatisfaction. This is particularly worrying because the above mentioned are hostel facilities. AUC's core service is providing educational services, hence students should be satisfied with teaching-enhancing facilities. The bedroom doors are also important for safe-keeping and security, hence any dissatisfaction with door-related issues ought to be addressed as a priority.

The survey further revealed that approximately 70% had made efforts to report noticeable faults or breakdowns at least once during their stay in Berekuso. Out of the remaining 30% who had never reported a case, 77% were either not aware of the communication process, or did not find the reporting procedures convenient enough, or were not confident that the problem would be solved. This was tied to a pressing issue that was discovered during the interview: that, the current manual method of data collection on facilities is ineffective because its procedures are either not well-communicated to the student body, or they are not deemed as effective. As a result, it was difficult to gather comprehensive data on equipment and maintenance issues. The remaining 23% of the number of students, who had never reported cases, had not done so because they had never observed or experienced the discomfort of any breakdown.

Perception of response by Operations team:

Lastly, the respondents shared insight into how they perceive the response rate of the Operations team during faults.

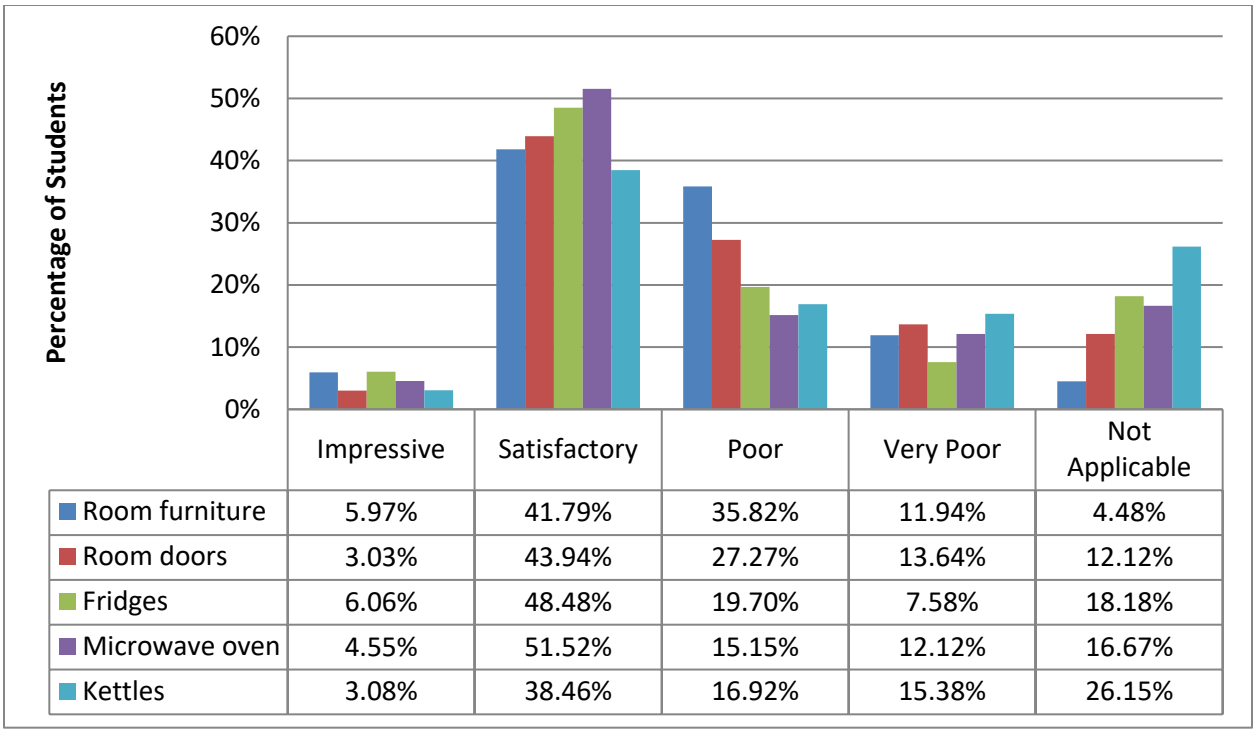


	Impressive	Satisfactory	Poor	Very Poor	Not Applicable
Photocopiers	16.18%	69.12%	4.41%	0%	10.29%
Computers	7.46%	47.76%	35.82%	2.99%	5.97%
Printers	7.35%	48.53%	26.47%	16.18%	1.47%
Projectors	13.43%	47.76%	25.37%	10.45%	2.99%

Figure 2.5: Satisfactory levels for response rates of academic facility repairs

Source: Student survey

According to Figure 2.5, about 85% of respondents were satisfied with the response rate of operations personnel on photocopiers. This was the most favorable rating. The response rates of computer and projector complaints received the worst ratings. An average of 45% of respondents, were not satisfied with their response rates.



	Impressive	Satisfactory	Poor	Very Poor	Not Applicable
Room furniture	5.97%	41.79%	35.82%	11.94%	4.48%
Room doors	3.03%	43.94%	27.27%	13.64%	12.12%
Fridges	6.06%	48.48%	19.70%	7.58%	18.18%
Microwave oven	4.55%	51.52%	15.15%	12.12%	16.67%
Kettles	3.08%	38.46%	16.92%	15.38%	26.15%

Figure 2.6: Satisfactory levels for response rates of hostel facility repairs

Source: Student survey

As Figure 2.6 suggests, kitchenette facilities received worst ratings concerning the response time for their repair. An average of 49.3% of respondents felt response rates to kitchenette problems were poor. This could be attributed to some established reasons. For instance, it was deduced from discussions with students and Operations personnel that, the late report of faults to authorities and difficulty in getting repairers to fix kitchenette problems were possible causes for the slow response rates. That notwithstanding, an efficient communication system between students and relevant authorities could prove valuable in determining reasons for dissatisfaction and slow response rates.

2.4.3 Interviews

The interviews were conducted with the head of AUC's Operations department, head of Library Department, and an authority in the IT department. Greater emphasis was however placed on the Operations department since it presides over the other two departments with respect to AUC's facilities maintenance.

2.4.3.1 Interview with Operations Department

The objective of this interview was to identify the strengths and weaknesses of the department, and to investigate the facilities' maintenance culture. Again, the interview sought to find out how the Operations department gathers information on faults and breakdowns, and how it responds to them. 19 questions geared towards these objectives were posed to the Operations head who was very generous in disclosing information.

The main issue that emerged from the interview was the ineffective manner in which data on equipment performance and breakdown reports were collected and processed. This revelation was crucial in providing the research with information on the causes of the challenges students had with facilities.

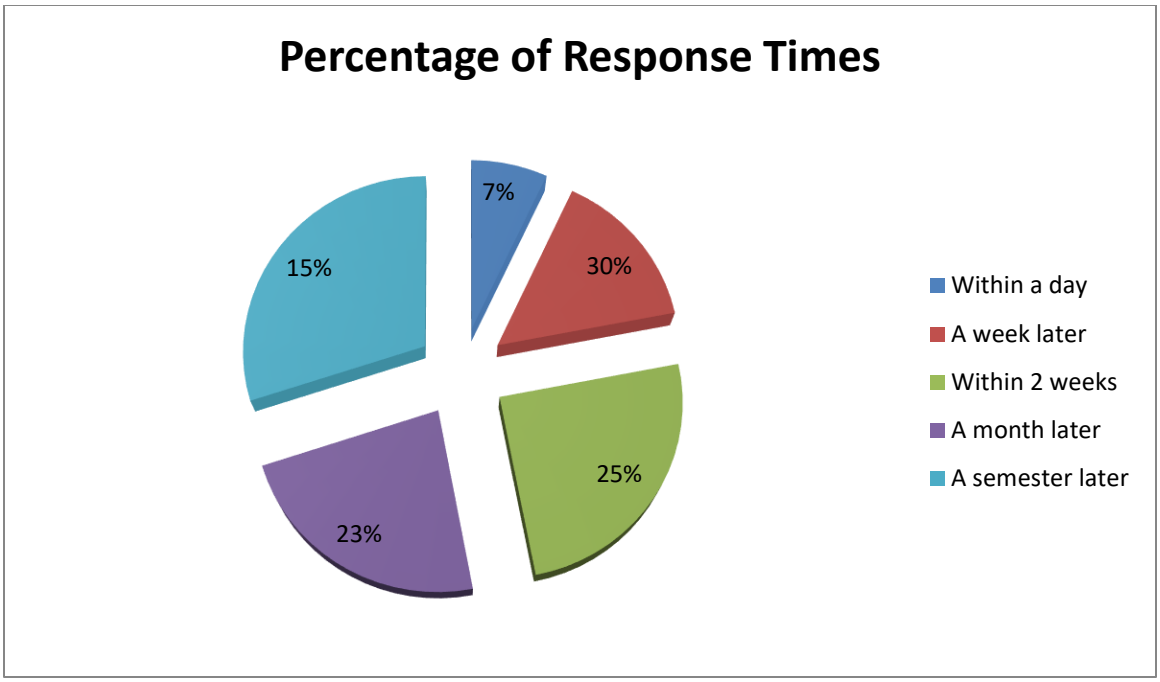


Figure 2.7: Rates of response after a report is made

Source: Interview with head of operations and hostel coordinators; data entries recorded in hostel reports book

2.4.3.2 Interview with Library Department

AUC's library has 12 student computers, two photocopiers, two projectors, and a scanner. The Library interview was done with the head librarian, and it sought to establish how library personnel manage the library academic equipment and reports of equipment breakdowns.

The highlighting discovery of the interview was that the library relies more on breakdown maintenance than preventive maintenance schedules.

2.4.3.3 Interview with Information Technology (IT) Department

The interview in this department was done with an authoritative IT officer. The office consists of three personnel. The discussion revealed that the IT department is strictly responsible for the maintenance of the computers, projectors and printers. However, they are accountable to the operations department.

The major challenge with their operations was that, they do not employ any method to ascertain the reliability and breakdown rates of facilities within their jurisdiction. This is because at the moment, they do not attach much importance to checking reliability

2.4.3.4 Findings and Analysis of Interview Data

Operations Department

Essentially, the objective of the Operations department is to effectively manage all equipment and facilities under its jurisdiction to ensure that, they function efficiently to support the overall objectives of AUC. The major strength of the department lies in its competent human resource and the autonomy it possesses to making prudent decisions without any unnecessary inhibitions.

Unfortunately, the Operations department frequently experiences challenges in the form of unreliable supply of electrical power to the school. This severely affects the performance of electrical equipment like generators and air-conditioners which are overly dependent on the supply of electricity. The head of Operations disclosed that the Operations department consists of a facilities officer, two Operations Management (OM) assistants, two drivers, one and three hostel coordinators. Each

of them had their respective roles to play, however, the facilities officer and the two OM assistants were specifically responsible for managing equipment breakdowns and ensuring their proper function.

Basic information on the number of equipment is recorded in the Assets register which is controlled by the Operations and Finance departments. The maintenance of all the mentioned facilities with the exception of computers and printers, fall under the Operation department's jurisdiction. The dominant type of maintenance on the facilities is breakdown maintenance. Preventive maintenance is conducted on the projectors by the contractors who provided them.

It was also learned that the Operations team is not highly skilled when it comes to repairing faults on academic equipment, hence the need to contact the equipment suppliers when there is a breakdown. Unfortunately, there have been a couple of instances where the contracted firms delayed work on breakdowns, citing the long distance of AUC's campus from the firms' locations as the reason. Other facilities like hostel furniture had to be repaired by external repairers under the supervision of the hostel coordinators. Nonetheless, AUC maintains a healthy relationship with its maintenance firms.

Information Technology (IT) Department

Similarly, the IT department runs maintenance schedules on computers once a year. Outdated hardware are replaced by the IT personnel, and the parts are taken out and dusted. Computers are protected by two anti-virus software- Microsoft Essentials and E-scan- through a server. Hence, apart from the projectors and

computers, all other mentioned facilities in the Library, IT and Operations departments undergo maintenance only when there is a breakdown.

Again, it was revealed that, there was one instance of infant mortality where a projector blew twice within the first half of a semester in a particular lecture hall. The contractor refused to pay damages until the University had investigated the true cause of the breakdown. The Operations team discovered that a Uninterrupted Power Supply (UPS) system had not

been installed, hence the occurrence of the unfortunate incident. The contractors then decided to take responsibility of any future mishap on the condition that AUC performed its responsibilities such as installing UPS systems.

Library

The interview with the head librarian revealed that maintenance on facilities occurs only when they break down. The library has contact information of a number of outsourced maintenance personnel. Hence, they report to these repairers when faults occur. A notable phenomenon is with the fact that breakdowns and faults in the library are not reported to the operations department. This is despite the fact that the library is accountable to the operations department with respect to facilities. The head librarian explained that this is part of the autonomy given to the library. However, this situation makes it difficult for the operations department to collate data on equipment performance for analysis.

2.5 Summary of Needs Assessment Results and Implications

Another discovery was the fact that, the library and IT departments, although under the authority of the Operations team (with regards to the management of equipment), has a lot of autonomy. This high level of autonomy often results in poor coordination between the Operations team and the two departments. There is poor communication and synchronization of information related to equipment management among the three departments. Consequently, the Operations department ended up being unaware of many equipment-related problems coming from the library and IT departments due to the methods of data transfer.

Another issue that needed to be addressed was the lack of an effective system or method of collecting data on equipment faults and breakdowns. It was learned that, little effort was made to track breakdowns and measure the response rate of how faults are fixed. The current system of manually recording cases is slow and inconvenient. According to the Operations head, a reliable electronic approach would prove useful.

Essentially, the findings of the interviews and the survey confirmed the observations. Consequently, important questions that need to be answered to improve upon the current situation include:

- How can the Operations department improve on the manner in which it manages the facilities under the scope of this project?
- How can the communication system between the IT, Library and Operations departments be improved to ensure that information on

facilities is well-synced to allow for better data processing and tracking? and

- How can students' reports on facilities breakdowns be conveniently and speedily communicated to the relevant authorities?

2.6 Chapter Conclusion

The aim of this chapter was to investigate the student body's satisfactory levels for the performance of facilities, as well as the response rate of maintenance personnel during faults. The conclusion was that students are dissatisfied with the performance of facilities and are not impressed with the response system for response. Interviews were then conducted on the IT, library and operations department to identify the gaps in their operations with regards to facilities maintenance. They were used as techniques to conduct a needs assessment. The major findings were:

- There is a consensus among students showing their dissatisfaction at the way facilities are managed
- The structure for information gathering and processing is disorganized
- There is poor data coordination between Library, IT and operations department
- There are challenges with outsourced maintenance firms with regards to transportation to AUC's campus. This significantly slows down the rate at which repairs are fixed.

Based on these identified issues, a maintenance model was developed to solve the challenges. This model was also done in consultation with already existing models that have been effective in some organizations.

Chapter Three

Literature Review

3.1 Chapter Overview

In the attempt to come up with a solution for AUC's maintenance challenges, a number of authoritative materials on the subject of maintenance were studied. They were gleaned from existing literature on facilities maintenance with the aim of understanding the concepts of maintenance and reliability. The materials were also helpful in gathering useful ideas that would be relevant to the AUC's context. Also, it helped to understand the processes other firms use to ensure efficiency in the maintenance department of their operations.

The maintenance models that are going to be discussed in this chapter are from five operations authorities. This sectionr will describe their models and what they entail. The chapter will end by zeroing in on the model on which this project's solution is based. This model is by Heizer and Render (2011).

3.2 Maintenance Models

3.2.1 Krar's Maintenance Model

Steve Krar's (2012) article centered on the need to move away from a 'fail and fix approach' to a 'predict and prevent approach'. This is because, the cost of regular maintenance is insignificant when it is compared to the cost of a major breakdown when production seizes. Krar (2012) described the 'fail and fix' approach as the situation where firms conduct maintenance and repair work only when facilities

develop faults. The better alternative, according to him is the 'predict and prevent approach'. With this approach, firms put in place appropriate techniques and technology to help anticipate faults on equipment. The occurrence of actual faults would then be mitigated by the early anticipation system. According to the article, the 'predict and prevent' approach can be ensured through autonomous maintenance and the continuous application of technology and intelligence maintenance systems. Adopting this maintenance approach will ensure that, production equipment would function at near 100% efficiency at all times.

Autonomous maintenance is where a firm trains operators to manage small maintenance jobs on equipment so that other skilled personnel can focus on activities that require a higher level of technical expertise (Krar, 2012). With regard to technology, Krar (2012) recommended the application of modern information and computing technologies which have the ability to identify machine failures and transmit signals to repair teams. These intelligent systems gather data from sensors and predict the future performance of systems by using data from the sensors. The use of technology would ensure rapid response to maintenance issues.

Krar (2012) further discussed the crucial role maintenance plays in ensuring the effectiveness of lean manufacturing, stating that, maintenance helps to reduce waste and run an efficient business operation.

This model is relevant to the AUC context, especially in the area of the application of technology. The collection and processing of maintenance data in AUC is done in an ineffective manual manner. Hence, information and communication technology (ICT) could be utilized to facilitate data collection and improve the response rate.

Also, AUC's operations team lacks the requisite skills to perform basic breakdown maintenance activities. In view of that, the concept of autonomous maintenance was worth considering.

3.2.2 Payne's Maintenance Model

Kirby Payne (2012) highlights the importance of preventive maintenance. He mentions that preventive maintenance should be incorporated into a firm's operations as a core and mandatory duty. Payne (2012) describes preventive maintenance as maintenance activities meant to forestall any likely breakdown. His research was however centered onthe hospitality industry, and paid particular attention to hotel rooms. It suggested that the starting point for conducting a successful preventive maintenance program is by management and workers being proactive. The research emphasized that preventive maintenance costs goes a long way to reduce maintenance cost in the long run. This buttresses the earlier argument by Krar (2012). Again, preventive maintenance reduces the incidents of emergencies and shapes the organization into an attractive and safe place to work.

One way is to effectively manage equipment and public spaces, as recorded in Payne (2012) is by keeping machinery and equipment clean, as well as inspecting equipment periodically (or according to the manufacturer's directions). Facilities that need frequent servicing also need to be monitored closely and serviced accordingly.

This model, which seeks to keep equipment clean and servicing regularly is relevant to AUC. This is because AUC engages more in breakdown maintenance. Dusty and

dirty facilities were also observed in AUC by the researcher. Again, the article stressed on the need to use work orders to record equipment faults and schedule preventive maintenance works. Work orders in the AUC context would be maintenance or repair complaints made by AUC students. Payne (2012) noted that, although many organizations use work orders, a great portion do not organize their work orders. Consequently, it becomes difficult to keep track of data and apply them to improve a firm's operations.

3.2.3 Abecunas' Maintenance Model

In "Building a Foundation for Maintenance & Reliability 'Best Practice' Work Processes in EAM", Dave Abecunas (2008), sought to prescribe the best methods or process for ensuring an effective maintenance and reliability system. Abecunas (2008) advocated the use of Enterprise Asset Management (EAM) as a more reliable option over Computerized Maintenance Management Systems (CMMS). He described CMMS as a "maintenance tool for producing work orders, tracking performance, providing parts and storing the history for assets" (Abecunas, 2008). EAM, which goes beyond the CMMS, encompasses a greater scope of the organization, including "purchasing, financial human resources, payroll, production processes and projects" (Abecunas, 2008). This author designed a framework for managing maintenance known as Basic Work Processes. The elements of the framework which are equally important and complement each other are: Identify work, Plan work, Schedule work, Execute work, Document work (IPSED).

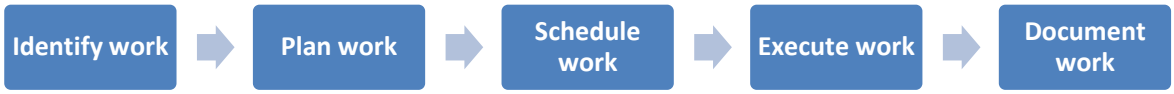


Figure 3.1: Basic Work Process Maintenance Framework (IPSED Model)

Source: Abecunas (2008)

Explaining the various stages in the model, as described in Abecunas (2008), i**dentifying** work refers to the need to prioritize which equipment are most susceptible to breakdowns, and paying attention to them in order of priority. **Planning** work involves employing an experienced and knowledgeable individual who specializes in creating, executing and monitoring future maintenance schedules. **Scheduling** is where a scheduler determines a material's availability, internal and external resources, and the asset to be worked on. Work **execution** occurs when planned and scheduled works are implemented on equipment. The author then underscored the importance of documenting maintenance activities.

This model is particularly relevant to the AUC context with regard to its mention of basic work processes and the use of information technology. This is because, findings from the interviews showed that AUC falters when it comes to planning, scheduling and executing maintenance work. Documentation of activities is also hampered due to the challenges of the manual method of recording.

3.2.4 Gulati and Smith's Maintenance Model

In the book, "Maintenance and Reliability Best Practices", Gulati and Smith (2009) advocates that, the adoption of best practices in an organization's maintenance and reliability system will result in increased output with the same assets. They define

best practices as "an idea which asserts that there is a technique, method, or process that is more effective at delivering a desired outcome than any other technique, method or process" (Gulati and Smith, 2009). The implementation of best practices would help meet the objective of maintenance and reliability which is to ensure that, assets are available in a cost effective manner when needed.

Best practices include the use of principles and techniques like Failure Mode and Effects Analysis, Reliability Centered Maintenance, Condition Based Maintenance and Predictive Maintenance technologies. According to the book, these techniques were designed through a collaborative effort between scientists and engineers in the United States air force and aviation industries. According to their model, implementing these best practices will help an organization reduce maintenance cost per unit, improve performance and increase the firm's competitiveness (Abecunas, 2008).

Relating this to AUC University, it is safe to conclude that the adoption of a 'best practice' system would prove cost-effective for the operations department, as well as facilitating the students' educational experience.

In view of these identified concepts and ideas, the task was to build a program that would incorporate some of these ideas, depending on their usefulness to the AUC context.

3.2.5 Heizer and Render Model

Heizer and Render (2011) suggest a model that is very relevant to the AUC context. According to Heizer and Render (2011), maintenance refers to all activities involved

in keeping a system's equipment in working order. Similarly, reliability is the probability that a machine part or product will function properly for a specified time under stated conditions. The objective of both concepts is to maintain the capability of the system (Heizer and Render, 2011). In their book, "Operations Management", the authors state that the two major maintenance tactics are to implement or improve preventive maintenance and to increase repair capabilities or speed (Heizer and Render, 2011).

Their model revolves around these two tactics. Heizer and Render (2011) explain that there are two types of maintenance- preventive maintenance and breakdown maintenance. Preventive involves conducting routine inspections, servicing and keeping facilities in good repair. Breakdown maintenance occurs when equipment fails and must be repaired on an emergency basis. Under preventive maintenance, the authors state that it is important for maintenance systems to be computerized. Such a system should be used to maintain records of individual processes and facilities. The computerized system should contain data files of maintenance and work order schedules, repair history, equipment file, inventory of spare parts, and maintenance personnel data. These records would provide a profile of the kinds of maintenance required and the timing of maintenance needed.

Again, the books suggest six features of a good maintenance system: well-trained personnel; adequate resources; ability to establish a repair plan and priorities; ability and authority to do material planning; ability to identify the cause of breakdowns; and finally, the ability to design ways to extend mean time between failures. Another concept, known as autonomous maintenance, is mentioned.

Autonomous maintenance is the approach where preventive maintenance policies include an emphasis on employees accepting responsibility for observing, checking, adjusting, cleaning and giving notification for the type of equipment maintenance. The authors state that allocating more resources to preventive maintenance will reduce the number of breakdowns. The framework provided by Heizer and Render (2011) are of relevance to the Ashesi context and have been adopted for this project. The framework is shown in Figure 8.

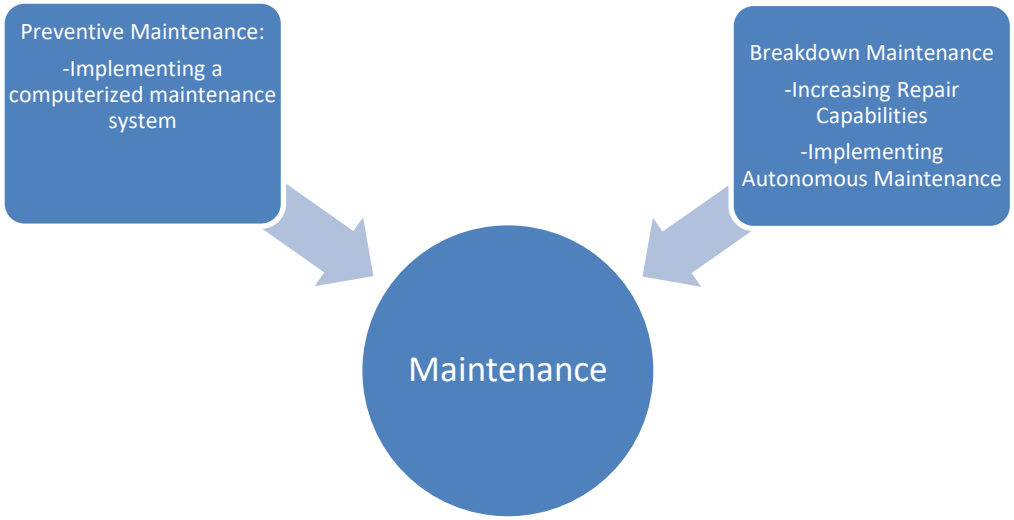


Figure 3.2: Theoretical Framework

Source: Heizer and Render (2011)

3.3 Adopted Maintenance Model- Heizer and Render

The decision to adopt the Heizer and Render (2011) model was due to its relevance to the AUC maintenance situation. Compared to the other mentioned models, the Heizer and Render model is cost-effective, simple to grasp and implement. Also, the model is can be suitably adapted to service firms like Ashesi. The other models

were more skewed towards manufacturing firms or firms which use heavy machines and equipment. Of particular importance to the AUC system is the computerized system containing important data files, as proposed by Heizer and Render (2011). This is helpful for addressing AUC's disorganized structure of collating maintenance reports. Also, the techniques for increasing repair capabilities and implementing autonomous maintenance would be helpful in addressing AUC operation personnel's inability to solve minor breakdown problems. Consequently, equipping them with these basic repair skills will be instrumental in addressing the poor response rate that characterizes the maintenance system. Hence, the deliverables of this project were inspired by the contents of the Heizer and Render model- computerized system, increasing repair capabilities and implementing autonomous maintenance.

3.4 Chapter Conclusion

In conclusion, this chapter sought to examine existing maintenance models that have proven useful for firms. The objective was to glean ideas from the models and assess their relevance to AUC's maintenance challenges. After studying five different models, the decision was made to adopt significant portions of the Heizer and Render (2011) model. The selected parts of the model are the computerized data system, personnel training and implementing preventive maintenance schedules. The model was chosen based on its simplicity, cost effectiveness and its adaptability to the Ashesi context.

Chapter Four

Deliverables and Conclusion

4.1 Chapter Overview

The objective of this project was to develop a set of solutions that would improve the efficiency and effectiveness of AUC's maintenance system. This objective was arrived at after exploring the various issues and challenges characterizing the current system. The main issues identified were: disorganized and ineffective method of collating and processing fault complaints; the absence of a way of assessing students' experience with equipment and facilities; and slow response rate of maintenance personnel when cases were reported.

In coming up with the solutions, concepts and ideas from existing maintenance models were evaluated to assess their relevance to the AUC context. The model by Heizer and Render (2011) was adopted because it is simple and effective, easy to understand and apply, and most importantly, it addresses the entire set of problems the AUC system is fraught with. This chapter seeks to propose and describe a solution, in the form of deliverables, to the challenges identified, using the adopted model. It will touch on how the deliverables work, feasibility, some cost-benefit analysis, and finally conclude the entire project.

4.2 The Deliverables

Of particular importance was the mention of technology as an important tool in facilitating an efficient maintenance system. However, issues regarding cost, effectiveness and simplicity were deemed as very important. With these

considerations in mind, the set of deliverables for this maintenance project are as follows:

1. An online form that would serve as an electronic database of maintenance issues so that data can be properly organized, effectively analyzed and safely stored
2. Data sheets that will be manually entered into manually, to complement the online form;
3. A survey form that will be used to periodically assess end users' (students in this case) use of and experience with the facilities; and
4. A cost-benefit analysis of a recommendation to employ the services of a maintenance outfit located near the AUC campus.

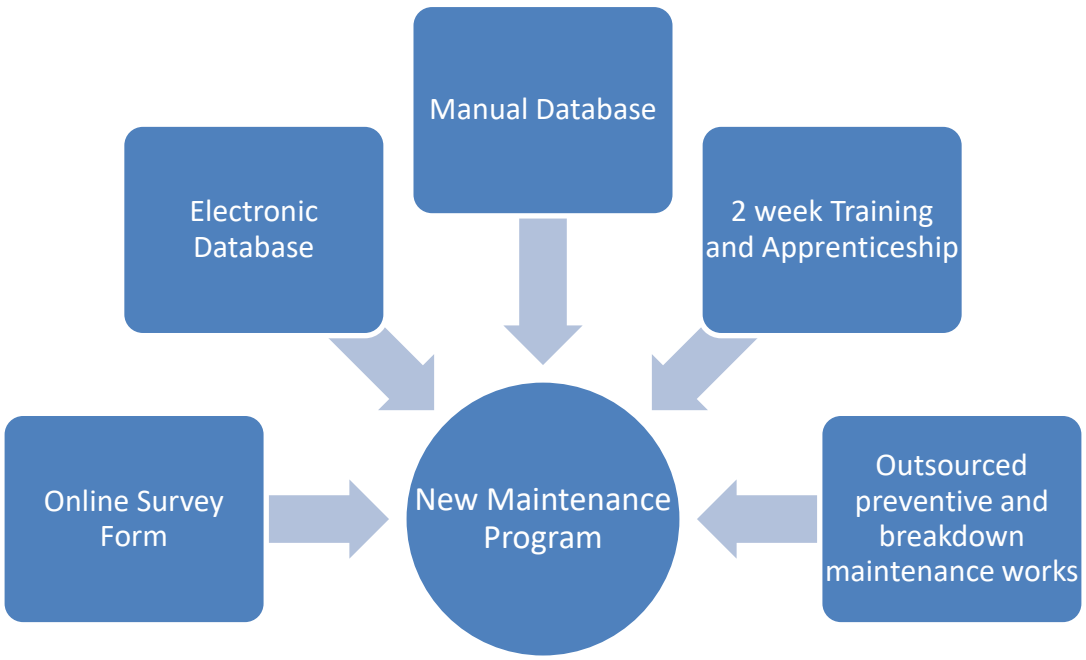


Figure 4.1: The proposed set of deliverables for AUC's maintenance system

4.2.1 Identification of Facilities

For proper identification of facilities and organized recording of reports, some selected facilities will have unique identity codes (IC). For academic facilities, the IC will have the first two letters of the facility concerned, followed by the location of the facility. Library and lab computers will be assigned numbers for easy identification. The numbers will be written on small label paper and stuck on the edges of the facility. Hostel facilities will be identified by quadrangles and room numbers, as well as numbers in the event where there are two or more similar facilities at an exact location (for example, fridges in kitchenettes). Samples of the identification method are shown in Table 4.1. A comprehensive code is provided in Appendix 2.

Table 4.1: Sample of identification system for hostel and academic facilities

Equipment/Facility	Location	Identity Code
Projector	Lecture Hall 218	Pro218
Computer	Library	Co9Lib
Photocopier	Library	Ph1Lib

4.2.2 Electronic Database

The electronic database is an online form that is freely provided by Google®. It is available on the Google® Drive platform. The online form exists for both hostel and

academic settings. This is to make it easier to organize information and help the administrators of the form to assess how well both settings are performing with regards to facilities management. The form contains a drop down menu to make it easy to report. The menu consists of the following:

- The date a fault or issue was observed;
- The facility concerned;
- The location of the facility: whether it is located in the hostel, lecture hall, computer laboratory or library;
- A brief description of the problem;
- Contact address of the person making the report; and
- The date the fault was fixed.

For the purpose of this project, the online form will strictly include the set of selected facilities identified in this project. As the administrators of the software become familiar with it, other facilities can be added after consultation with students and hostel coordinators.

The user-friendly online form will have the heads of the operations and IT departments as the administrators. Users will then be required to access the form via a Uniform Resource Locator (URL) which will be made available on AUC's webmail platform. The IT department will create a maintenance folder on the webmail where students can enter to access the URL. After clicking on the URL which opens the online form, entries can be made. Keyed entries then move onto the administrators' page for them to analyze and respond to the reports.

The advantage of the online form is that users can conveniently make reports anywhere and anytime internet access is available. The form will be available on desktop computers, laptops, tablets and smart cell phones as it is web based. As a result, reports can be made even when users are not on campus to inform the appropriate office of what the defects are. Also, it is easy to identify which of the complaints have been unattended to. Specific facilities can be filtered for detailed analysis of frequency of reports. Also the software comes with the option of using graphs and charts to process and analyze keyed in data. The contact address of the user who reports is requested so that feedback can be given to them about the status of a reported issue. They will also be able to give feedback about whether the issue has been properly dealt with or not.

The disadvantage, however, is that, once internet access is unavailable, making a report online would be impossible. This challenge is addressed by the next deliverable: manual data sheet.

The electronic database requires instructional steps for effective use. The project researcher has already made the IT and Operations Department administrators of the program. This means that they have unlimited control over the electronic system, unlike the end users (students) who can only make entries but not view reports. The steps below outline the procedures needed to use this deliverable effectively:

1. The administrators invite the entire student body to the database platform. This is done by adding students' electronic mail addresses to the platform. This option is visible on the administrators' page.

2. Upon invitation, students are to respond by creating a Google® mail account (if they do not already have).
3. Once a Google® mail account is formed, students can always access the electronic platform by clicking the link (which is accessible on the AUC webmail) and then signing in with their Google® mail details.
4. From there, complaints can be made on the user-friendly interface

Below is a screenshot of a part of the electronic database. The complete database system is shown in Appendices 4, 5, 7 and 8

Figure 4.2: Screen shot of the user interface of the electronic data form for academic facilities

4.2.3 Manual Data Sheet

This deliverable is similar in appearance to the online form. The main difference is that, entries are made manually. This is to cater for students who at the time of wanting to make a report may not have access to the internet. The data sheets will be prepared using Microsoft Excel®. They will be placed in each of the quads in the eight resident halls, the computer laboratories, the library, and each of the five lecture halls. The idea is that students can alternatively register reports on to the sheets in the event that it is more convenient to do so manually.

When a report is entered onto the data sheet, the reporter is to hand the sheet to the AUC work study receptionists or the hotel coordinators. The receptionists will be responsible for academic facility complaints, and will notify operations personally immediately. Manual entries are however to be transferred to the electronic database for record keeping purposes. A screenshot of the manual data sheet is shown on Appendix 9.

4.2.4 Feedback Survey

The survey will be in the form of questionnaires to determine students' satisfaction levels with maintenance activities. It will be available online for students to fill at the end of every semester. The URL for the feedback form will be accessible in the maintenance folder on AUC's webmail platform. This folder will be created by the IT department. As a starter, only selected facilities will be provided for assessment in order to limit the scope of the project. With time, other facilities will be added depending on students' feedback. Students' response from the survey will be

assessed by the operations department to help improve the maintenance system. The analysis of the responses is at the discretion of the head of the operations department.

The feedback form has the option of graphing responses and giving their percentage values. The interpretation of the results, as given by the form's software, will be used make informed decisions concerning the maintenance system. For instance, the form asks questions about student's satisfactory levels with the performance of selected facilities; student's satisfaction with the response rate of operations personnel; and students' satisfaction with reporting procedures. A result of more than 50% of respondents expressing dissatisfaction means that the operations department would need to critically assess the maintenance system to identify the sources of displeasure. A sample of the feedback form is provided in Appendix 3.

4.2.5 Outsourcing of Maintenance Services

The decision to do a cost-benefit analysis was arrived at, after the Head of Operations expressed his dilemma about whether to outsource maintenance services to an agency, or to equip AUC operations personnel with the skills to handle maintenance issues. Ironically, the Operations Department does not keep cost records of maintenance works. Records are pulled from the department, however, they are difficult to extract because they are not categorized as maintenance records. They are lumped up together with other operational costs. As a result, it was difficult to gauge current costs and compare to the cost of outsourcing.

The interview with the operations head revealed that, external repairers had expressed their displeasure about leaving their sites to AUC's Berekuso campus due to the discomfort that came with the journey. This was mainly due to the fact that the campus is on the outskirt of Accra, and the terrible nature of the road. For the purpose of this project, in-house/AUC repair personnel will be referred to as 'internal repairers' while the 'external repairers' would refer to repairers who do not form part of AUC's core human resource personnel: an outsourced contractor.

The advantage of outsourcing is that it gives the Operations department the peace of mind to focus on other operational issues, while giving the outsourced specialists the duty to extensively manage the facilities. The disadvantage of adopting outsourcing in this case is that it is costly when the distance between the outsourced contractor and its client is far. Training in-house personnel is also advantageous because it enables the Operations team to quickly respond to issues and avoid the challenges that come with transporting external repairers to the AUC campus. As mentioned in the Heizer and Reinder (2011) model, not having skilled in-house personnel to manage minor maintenance issues can prove costly to the firm. In view of these two options (outsourced contractor and internal repairers), this project sought to exhaust all available means to find the optimal solution.

Consequently, the researcher was able to contact a maintenance agency located at Pantang, less than thirty minutes' drive from AUC's campus. The maintenance agency, Home Maintenance, is a maintenance outfit that specializes in preventive maintenance and breakdown maintenance works for residential and corporate outfits. The company is engaged in plumbing, electrical, carpentry, masonry and

gardening works. The General Manager of the company expressed high interest in establishing a relationship with AUC, as well as being available to improve AUC's maintenance management system.

A meeting between the General Manager and AUC's Head of Operations has been proposed and is on schedule. The discussions will focus on building a relationship and outsourcing AUC's preventive and breakdown maintenance works to Home Maintenance. The close proximity is also expected to help AUC save significant costs on maintenance activities and help improve on response rates. Furthermore, the maintenance agency agreed to allow two AUC personnel undergo a free two-week apprenticeship at its Pantang base. The personnel will undergo training in basic electrical, carpentry and plumbing works. This will enable them to attend to minor faults that occur in the hostel. Home Maintenance is a reliable agency whose clients include some reputable corporate firms in Accra, Ghana. Based on the two outfits' track records of managing healthy and profitable client relationships, AUC and Home Maintenance can look forward to a win-win deal.

4.3 Project Conclusion

In conclusion, this research project set out to diagnose the maintenance system of AUC's academic and hostel facilities. The research was prompted by reports and sentiments of student dissatisfaction about the way repairs were conducted on faulty facilities. Consequently, the project carried out a survey to assess students' satisfaction levels on the use of facilities in the academic and hotel settings. The survey sampled 72 students who gave very similar views of dissatisfaction, indicating a data saturation point.

A needs assessment was conducted on all in-house departments responsible for the maintenance of the selected AUC facilities. The selected facilities included all equipment used for academic purpose, and hostel facilities based on the frequency of fault complaints in the hostel report book. The needs assessment involved in-depth interview with heads of the operations, library, Information Technology departments, as well as one of the three hostel coordinators. The interview revealed that the poor collection, organization and processing of report data, coupled with the poor response rate was the major cause of AUC's inefficient maintenance system.

The poor response rate stemmed from poor in-house expertise in fixing faults, as well as external repairers reluctance to deal with Ashesi due to transportation challenges. In light of this, existing maintenance models were gleaned from available literature to test their applicability and relevance to the AUC context. After examining five useful models, the model developed by Heizer and Render (2011) was selected. The model focused on simple and effective techniques of implementing both breakdown and preventive maintenance. These techniques included the use of a computerized system to record and organize data on equipment, their repair history, as well as maintenance personnel. The concept of autonomous maintenance, where employees of a firm are trained and empowered to repair faults that do not necessarily need the attention of experts or maintenance specialists.

A set of deliverables to address the poor data collection and poor response rate was created. This consisted of an online form used to run an electronic database of

facility reports; a manual reporting procedure in the form of a data sheet to complement the electronic approach, an online survey to keep the operations department abreast of students (who double as the end users of the facilities) satisfaction levels for the use of the facilities; and the setting up of a meeting between AUC and Home Maintenance Company, where Home Maintenance would become outsourced maintenance contractors of AUC.

The simplicity, cost-effectiveness and relevance of the deliverables are set to make this project a success. Consequently, Ashesi students can look forward to a significantly improved and efficient maintenance system which will greatly enhance the Ashesi experience.

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Appendices

Appendix 1: Survey Questions for Students

1) What year group do you belong to?

a) 2013 b) 2014 c) 2015 d) 2016

2) How satisfied are you with the performance/ reliability of the following equipment/facilities in Ashesi? (Please tick)

	Very Satisfied	Satisfied	Averagely Satisfied	Barely Satisfied	Not at all Satisfied
1)Photocopiers					
2)Computers					
3)Printers					
4)Projectors					
5)Bedroom furniture					
6)Bedroom doors					
7)Bathroom facilities					

8)Kitchenette fridges					
9)Kitchenette microwave ovens					
10)Kitchenette kettles					

3) How often do you report machine/facility/equipment breakdowns or faults?
   a) Daily
   b) At least twice a week
   c) At least once a week
   d) At least fortnightly

4) If your answer to (3) is "never", why is that so?
   a) You are unaware of the channels to go through to report a fault
   b) The reporting process is not convenient and simple enough
   c) You are not convinced the problem will be solved
   d) You have not noticed any faults or breakdowns
   e) Other reasons (please specify) …….

5) How would you describe the response rate of Ashesi's maintenance personnel during periods of equipment/facility breakdowns? (Please select)

	Impressive	Satisfactory	Poor	Very Poor	Not applicable
1)Photocopiers					
2) Computers					
3)Printers					
4)Projectors					
5)Bedroom furniture					
6)Bedroom doors					
7)Bathroom facilities					
8)Kitchenette fridges					
9)Kitchenette microwave ovens					
10)Kitchenette Kettles					

6) Kindly rate the performance of the Operations Department with respect to managing facilities.

   1 (very poor) – 5 (excellent) …….

7) Other comments are welcomed in the space below:

   ……

Appendix 2: Identity Code for Facilities

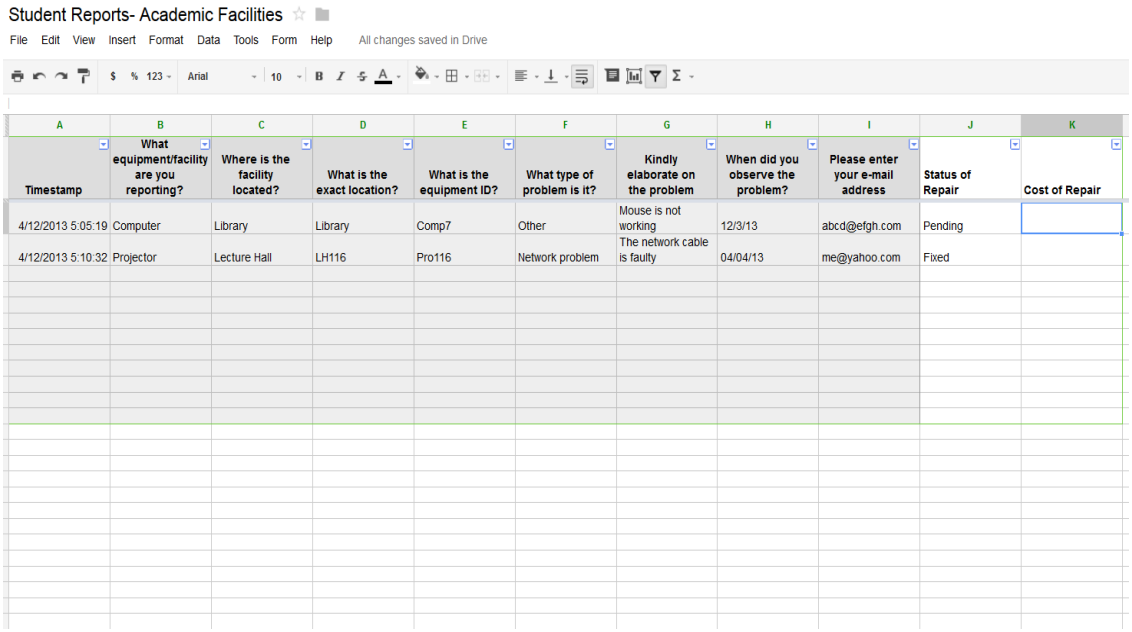
Facility	Location	Identity Code
Projector	Lecture Hall115	Pro115
Projector	Lecture Hall 116	Pro116
Projector	Lecture Hall 216	Pro216
Projector	Lecture Hall 217	Pro217
Projector	Lecture Hall 218	Pro218
Projector	Library Seminar Room 301	Pro301
Projector	Library Seminar Room 302	Pro302
Printer	Library	PriLib
Printer	Lab 221	Pri221
Printer	Lab 222	Pri222
Photocopier 1	Library	Pho1
Photocopier 2	Library	Pho2
Computers in library (there are 12 in all)	Library	Comp1, CompLib2, Comp, Comp4, Comp5, Comp6, Comp7, Comp8, comp 9, Comp10, Comp11, Comp12
Computers in Lab 221 (there are 20 in all)	Lab 221	Comp (number labeled on computer monitor)
Computers in Lab 222 (there are 18 in total)	Lab 222	Comp (number labeled on computer monitor)

Appendix 3: Interview Questions for Operations department

1) What facilities are you responsible for?
2) What facilities fall under other jurisdictions besides the Operations department?
3) Which people does the Operations team comprise of?
4) Which departments are accountable to the Operations department?
5) Is there a structured way of gathering data on equipment performance?
6) Is equipment performance tracking of importance to your team?
7) How do you track equipment reliability, breakdown and repair?
8) Do you run maintenance schedules on equipment
9) How do you measure the response rate of personnel when there's a breakdown?
10) Is there a channel through which students and lecturers can report faults?
11) Is the communication process between OM team and other departments effective and helpful in keeping track of equipment performance?
12) Which equipment are under warranty?
13) Does the Operations team run preventive maintenance schedules? Which is more common- breakdown or preventive maintenance?
14) Are Ashesi personnel trained to conduct any maintenance schedule or it is outsourced?
15) Have there been any infant mortality issues for some of the equipment the university has acquired? (Have any equipment broken down in their early stages?) If yes, how easy or difficult was it in using the warranty?

16) How is Ashesi's relationship with the equipment manufacturers and/or maintenance outfit? In other words, how committed are they to helping us with our maintenance issues?
17) Does Ashesi make use of maintenance and reliability software tools? What are the average maintenance costs?

Appendix 4: Administrator page for Academic Facilities

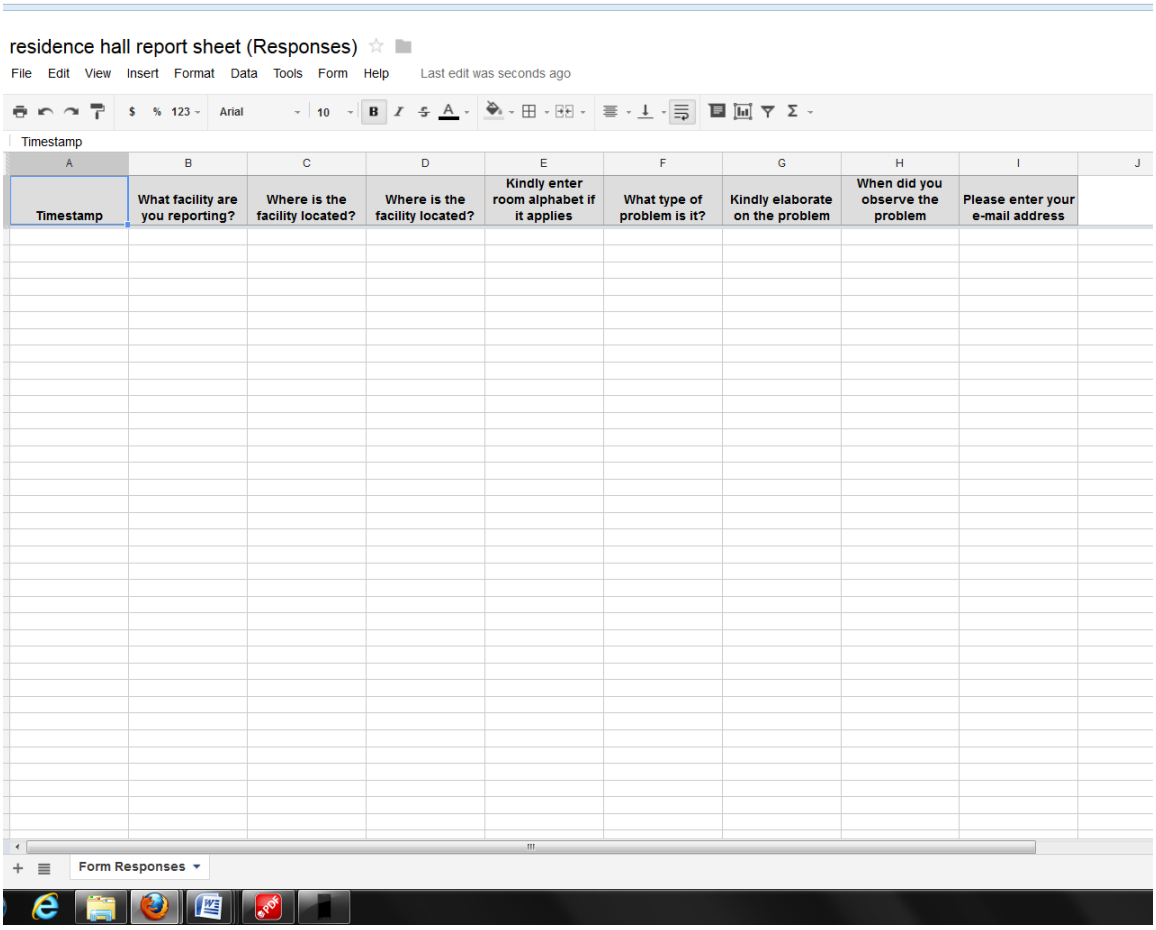


Student Reports- Academic Facilities

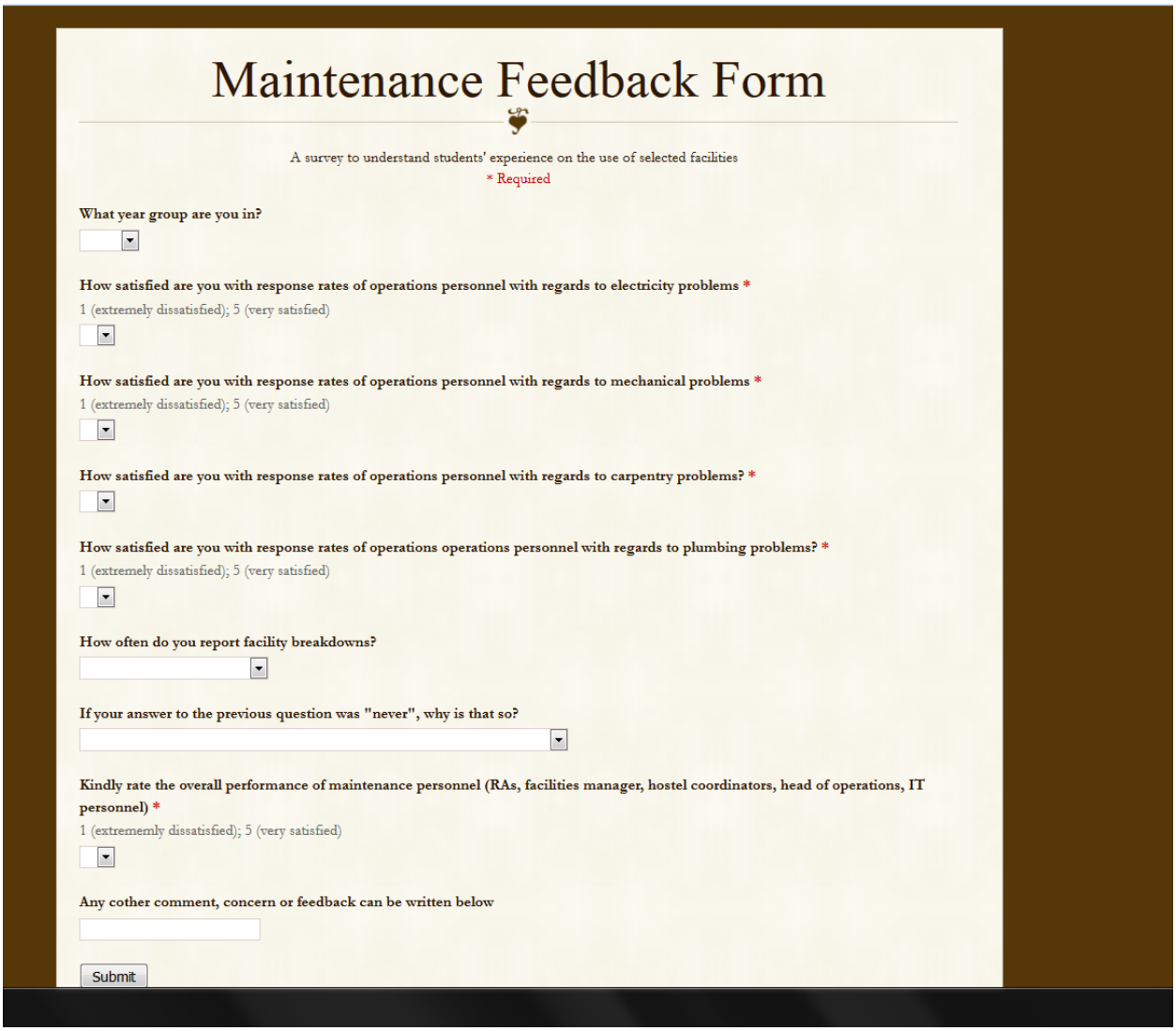
File Edit View Insert Format Data Tools Form Help All changes saved in Drive

Timestamp	What equipment/facility are you reporting?	Where is the facility located?	What is the exact location?	What is the equipment ID?	What type of problem is it?	Kindly elaborate on the problem	When did you observe the problem?	Please enter your e-mail address	Status of Repair	Cost of Repair
4/12/2013 5:05:19	Computer	Library	Library	Comp7	Other	Mouse is not working	12/3/13	abcd@efgh.com	Pending	
4/12/2013 5:10:32	Projector	Lecture Hall	LH116	Pro116	Network problem	The network cable is faulty	04/04/13	me@yahoo.com	Fixed	

Appendix 5: Administrator page for Hostel Facilities



Appendix 6: Online survey Form for User Feedback



Maintenance Feedback Form

A survey to understand students' experience on the use of selected facilities

* Required

What year group are you in?

How satisfied are you with response rates of operations personnel with regards to electricity problems *

1 (extremely dissatisfied); 5 (very satisfied)

How satisfied are you with response rates of operations personnel with regards to mechanical problems *

1 (extremely dissatisfied); 5 (very satisfied)

How satisfied are you with response rates of operations personnel with regards to carpentry problems? *

How satisfied are you with response rates of operations operations personnel with regards to plumbing problems? *

1 (extremely dissatisfied); 5 (very satisfied)

How often do you report facility breakdowns?

If your answer to the previous question was "never", why is that so?

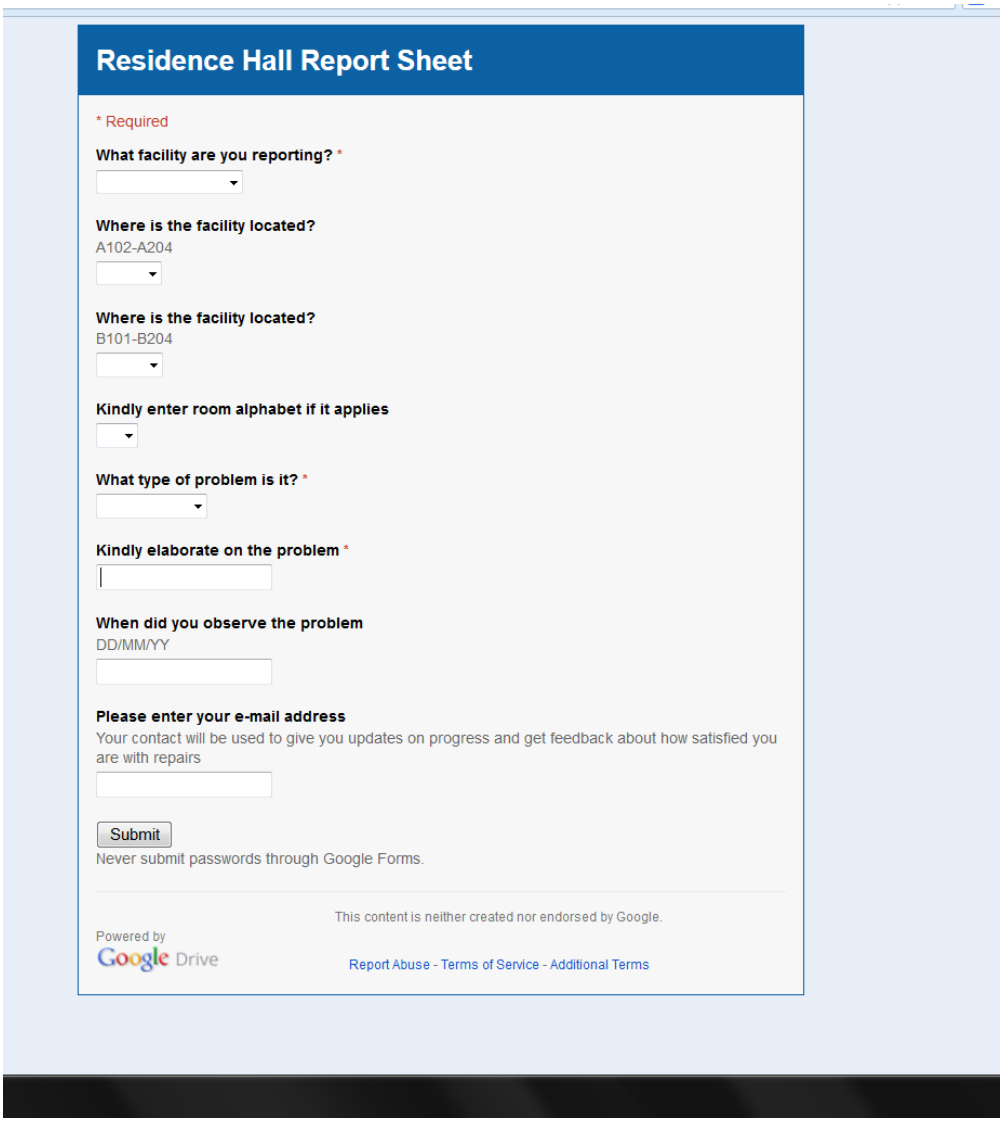
Kindly rate the overall performance of maintenance personnel (RAs, facilities manager, hostel coordinators, head of operations, IT personnel) *

1 (extrememly dissatisfied); 5 (very satisfied)

Any cother comment, concern or feedback can be written below

Submit

Appendix 7: User Online Report Sheet for Hostel Facilities



Residence Hall Report Sheet

* Required

What facility are you reporting? *

Where is the facility located?
A102-A204

Where is the facility located?
B101-B204

Kindly enter room alphabet if it applies

What type of problem is it? *

Kindly elaborate on the problem *

When did you observe the problem
DD/MM/YY

Please enter your e-mail address
Your contact will be used to give you updates on progress and get feedback about how satisfied you are with repairs

Submit
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Appendix 8: User Online Report Sheet for Academic Facilities

Academic Site Report Sheet

* Required

What equipment/facility are you reporting? *

Where is the facility located? *

What is the exact location? *

What is the equipment ID?

What type of problem is it? *

Kindly elaborate on the problem

When did you observe the problem? *
DD/MM/YY

Please enter your e-mail address
Your contact will be used to give you updates on progress and get feedback about how satisfied you are with repairs

Submit

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Appendix 9: A screenshot of the manual data sheet